UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
FERRIS III, FRED O

ART UNIT	PAPER NUMBER
2128	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	09/746,014	GOLDMAN ET AL.
	Examiner	Art Unit
	Fred Ferris	2128

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _22 November 2004_.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-10,13-24 and 27-33_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-10,13-24 and 27-33_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _11 May 2001_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

1.   Claims 1-33 have been presented for examination based on applicant's

amendment filed on 22 November 2004.   Claims 1-10, 13-24, and 27-33 are currently

pending in this application. Applicants have cancelled claims 1, 12, 25, and 26. Claims

1-10, 13-24, and 27-33 remain rejected based on new grounds for rejection.

Response to Arguments

2.   Applicant's arguments filed 22 November 2004 have been fully considered.

   Regarding applicant's response to 112(1) rejection: The examiner withdraws the

112(1) rejection in view of applicant's amendment to the claims and arguments filed 22

November 2004.

   Regarding applicant's response to double patenting rejection: The examiner

withdraws the double patenting rejection in view of applicant's terminal disclaimer and

amendment to the claims filed 22 November 2004.

   Regarding applicant's response to objection to the specification: The examiner

withdraws the objection to the specification in view of applicant's amendment to the

specification filed 22 November 2004.

   Regarding applicant's response to 35 USC 103(a) and 102(b) rejections: The

examiner withdraws the 102/102 rejections in view of applicant's amendment to the

claims and arguments filed 22 November 2004. However, claims 1-10, 13-24, and 27-

33 now stand rejected based on new grounds for rejection. (please see new 102(b) and

103(a) rejections below.

Claim Interpretation

3.   *Applicants are disclosing a system and method for automatic process control*

using design of experiments (DOE) techniques by analyzing input space comprising

boundaries (empirical data) to a process model during simulation. The examiner notes

that applicants appear to have broadly claimed the use of DOE in automatic process

control using based well-known DOE concepts when simulating the behavior of a

process model. (see: Kleihnen section I, II, for example) Further, the claimed limitations

relating to the measurement unit, controller, and regressor were known in the art and

available to a skilled artisan at the time of the invention, and are features generally

inherently available in the numerous commercially available DOE software packages

such as STATISTICA, Design-Expert, SimProcess, CARD. These features are also

available as add-ons to the popular MatLab, ANSYS, and ChemDraw programs.

Applicants have acknowledged this in amendment of 22 November 2004 page 14, line

10 to page 15, line 14. Accordingly, the examiner has as interpreted the elements of,

and hence the functions performed by, the measurement unit, controller, and regressor,

to be necessarily inherent elements of the prior art and any of these commercially

available DOE software packages. While such features are generally standard

features of the commercially available DOE software packages noted above (see: Angel

Section 2, table 1, for example), applicants are invited to explain any specific novel

aspects of the claimed limitations over the prior art.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. *Claim 15 is rejected under 35 U.S.C. 101 because the claimed invention is drawn to non-statutory subject matter.*

Per claim 15: The Examiner further submits that system claim 15, as written, are merely drawn to nonstatutory descriptive material since the claimed "data model and process model " do not appear to impart any functionality. (i.e. not a computer program product embodied on a computer-readable medium)

MPEP 2106 recites the following supporting rational for this reasoning:

"Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data. Both types of "descriptive material" are nonstatutory when claimed as descriptive material per se. Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759. When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized."

In this case, applicants have not claimed a process model or data model that is specifically embodied on a computer-readable medium.

Claim Objections

5. *Claims 9 and 21 are objected to as being in improper Markush format. (See: MPEP 2173.05(h) Appropriate correction is required.*

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6.   Claims 1-10, 13-24, and 27-33 are rejected under 35 U.S.C. 102(b) as being

anticipated by "Conducting Experiments With Experiment Manager", M. Angel,

pp. 535-541, Proceedings 1996 Winter Simulation Conference ACM 1996.

Regarding independent claims 1, 15, and 24: Angel discloses the

SIMPROCESS simulation and modeling tool for automatically assessing the

performance of a process model using DOE methods in establishing an input defined

number of experiments for analyzing the process model based on a computed output.

(Section 2.0, Table 1) Angel further discloses SIMPROCESS running an established

number of experiments on an process model and simulating the behavior of the process

model using a predefined input space (Sections 3, 4, Figs 2-4). As such, the examiner

asserts that the claimed DOE components of, and the processes performed by, the

measurement unit, controller, and regressor are necessarily inherent elements of the

SIMPROCESS modeling tool disclosed by Angel. That is, these "components" would

obviously be inherent in order to perform the DOE elements, the experiment analysis

(performance) and model simulation disclosed by Angel in Sections 2-4, Figures 1-4,

and in Table 1. Further, the claimed empirical data is merely information based on

observation and experience (i.e. part of any Taguchi DOE model) and would obviously

be inherent as part the "input" to SIMPROCESS. (Section 2, Table 1)

Per dependent claims 2-10, 13, 14, 16-23, and 27-33: SIMPROCESS includes

features relating to selecting number of experiments, factorial and screening (inputs)

experiments, performance (selecting runs), (i.e. defining the input space for a model

(predictive)), and adjustment of logic and parameters for describing a process. That is,

SIMPROCESS allows a user to define a formula for a predictive model (linear,

quadratic, etc.) based on predetermined significant criterion (Section 2, 3, Table 1, Fig.

3). SIMPROCESS also includes features relating to the use of random (confusion)

matrixes, and adjusting the logic or parameters based on simulation runs (Section 4,

Table 1) Angel further discloses the SIMPROCESS simulation and modeling tool for

automatically assessing the performance of a developmental process model using DOE

methods in establishing an acceptable number of experiments for analyzing an

algorithm (model). (Section 2.0, Table 1) Angel also discloses SIMPROCESS running

an established number of experiments on an algorithm (model), and simulating the

behavior of the process model using experiment performance results base on input

boundaries (Sections 3, 4, Figs 2-4).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set
forth in section 102 of this title, if the differences between the subject matter sought to be patented and
the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1.   Determining the scope and contents of the prior art.
2.   Ascertaining the differences between the prior art and the claims at issue.
3.   Resolving the level of ordinary skill in the pertinent art.
4.   Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. ·   Claims 1-10, 13-24, and 27-33 are rejected under 35 U.S.C. 103(a) as being

unpatentable over U.S. Patent 5,781,430 issued to Tsai in view of U.S. Patent

6,373,033 issued to de Waard et al and in further view of applicant's admission

that the claimed measurement unit, controller, and regressor were known in the

art and available to a skilled artisan at the time of the invention. (applicant's

amendment 22 November 2004 page 14, line 10 to page 15, line 14)

Independent claim 1, for example, is drawn to:
Automatic process control of input space with boundaries comprising:
process measurements at selected input space points (measurement unit)
selecting input space points to maximize information (controller)
obtaining predictive input space process model from measurements (regressor)

Regarding independent claims 1, 15, and 24: *Tsai discloses the elements of the*

claimed limitations of the present invention as previously cited above and as follows:

- Automatic process control of input space with boundaries comprising: (Summary,

Objectives I, II, III, Methods I, II, III See: CL3-L50-CL7-L39, CL13-L36-CL18-L26. CL18-

L27, Figs. 4, 8, 9-17)

- process measurements at selected input space points): (Summary, Objectives I, II, III,

Methods I, II, III See: CL3-L50-CL7-L39, CL13-L36-CL18-L26. CL18-L27, CL19-L17-50,

Figs. 4, 8, 9-17)

- selecting input space points to maximize information: (Summary, Objectives I, II, III,

Methods I, II, III See: CL3-L50-CL7-L39, CL13-L36-CL18-L26. CL18-L27, CL19-L17-50,

Figs. 4, 8, 9-17) Tsai discloses processes executed by the DOE module, RSM module,

and PWO module in Figures 8 and 9 (also see Objectives I, II, III, Methods I, II, III CL18-

L31 to CL19-L14 as noted above).

Tsai does not explicitly teach a predictive modeling process from measurements.

De Waard discloses the elements of the claimed limitations of the present

invention as follows:

- obtaining predictive input space process model from measurements (regressor): de

Waard discloses a predictive model of a process developed from process

measurements. (CL9-L38, CL10-L24-35, CL10-L39, CL15-L19, Figs. 6, 14A-21) de

Waard further discloses the use of auto-regression and a measurement controller in

model development. (Abstract, Summary of Invention, CL9-L38-65, Figure 5)

Tsai does not explicitly disclose a measurement unit, controller, or regressor.

(although the examiner believes these functions to be inherent DOE module, RSM

module, and PWO module in Figures 8 and 9 (also see Objectives I, II, III, Methods I, II,

III CL18-L31 to CL19-L14 as noted above).

Applicants have admitted that the elements of the measurement unit, controller,

and regressor were known in the art and available to a skilled artisan at the time of the

invention. (applicant's amendment 22 November 2004 page 14, line 10 to page 15, line 14)

It would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings of Tsai relating to DOE and automatic process control of input space with boundaries, with the teachings of De Waard relating to developing a predictive modeling process from measurements, to realize the claimed invention. An obvious motivation exists since this area of technology is highly competitive with many types of DOE process modeling techniques and products available in the market place and large amounts of money being spent in product development and improvement. (see: D. Boning, Kleijnen, Harlow Introduction/Conclusion, for example) Accordingly, a skilled artisan would have made an effort to become aware of what capabilities had already been developed in the market place and, hence, would have been knowingly modified the teachings of Tsai with the teachings of de Waard and to further modified the teachings of Tsai to include the elements of the measurement unit, controller, and regressor as were known to one skilled in the art, order to realize the elements of the claimed invention and reduce development time and cost.

Regarding dependent claims 2-10, 13, 14, 16-23, and 27-33: This group of dependent claims includes additional limitations relating to process modeling which are disclosed by the prior art as follows:

- *predictive modeling: de Ward – (Abstract, Summary, CL9-L38, CL10-L24-33, 39, CL15-L19, Figs. 6, 14A-21)*

- *geometric spacing: Tsai - (Summary, Objectives I, II, III, Methods I, II, III See: CL3-L50-CL7-L39, CL13-L36-CL18-L26. CL18-L27, CL19-L17-50, Figs. 4, 8, 9-17)*

- *boundary points: Tsai - (Summary, Objectives I, II, III, Methods I, II, III See: CL3-L50-CL7-L39, CL13-L36-CL18-L26. CL18-L27, CL19-L17-50, Figs. 4, 8, 9-17)*

- *linear/quadratic formulas: de Ward – (CL10-L49 to CL17-L59, Fig.6)*

- *quality assessment: de Ward – (CL10-L25-33)*

- *The claimed empirical data is merely information based on observation and experience (i.e. part of any Taguchi DOE model) and would obviously be considered as part the "input" disclosed in the prior art. (see: Harlow Section III, for example)*

- *Applicants have also admitted that the elements of, and hence the functions performed by, the measurement unit, controller, and regressor were known in the art and available to a skilled artisan at the time of the invention. (applicant's amendment 22 November 2004 page 14, line 10 to page 15, line 14)*

Conclusion

8.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

"DOE/Opt: A System for Design of Experiments, Response Surface Modeling, and ·

Optimization Using Process of Device Simulation", D. Boning, IEEE Transactions on

Semiconductor Manufacturing, Vol. 7, No. 2, May 1994 discloses DOE and automatic

process control.

"Design of Experiment is the best way to Optimize a Process at Minimal Cost", S.

Kumar, IEEE/CHMT '90 IEMT Symposium, pp 166-173, IEEE 1990 discloses DOE and

automatic process control.

"Validation of Models: Statistical Techniques and Data Availability", Kleijnen,

Proceedings 1999 Winter Simulation Conference, pp. 647-654, ACM 1999 discloses

DOE and automatic process control.

"Design of Experiments in BDD Variable Ordering: Lessons Learned", Harlow et al,

ICCADA 98', pp. 646-652, ACM 1998 discloses DOE and automatic process control.

        Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Fred Ferris whose telephone number is 571-272-3778

and whose normal working hours are 8:30am to 5:00pm Monday to Friday. Any inquiry

of a general nature relating to the status of this application should be directed to the

group receptionist whose telephone number is 571-272-3700. If attempts to reach the

examiner by telephone are unsuccessful, the examiner's supervisor, Jean Homere can

be reached at 571-272-3780. The Official Fax Number is: (703) 872-9306

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